19TH PLANT DEVELOPMENT WORKSHOP

SATURDAY, APRIL 4, 1987

UNIVERSITY OF WESTERN ONTARIO

LONDON, ONTARIO

PRELIMINARY PROGRAM

9:00 - 9:30 Registration
9:30 - 11:00 Six 15 min. papers
11:00 - 11:30 Refreshment break
11:30 - 13:00 Six 15 min. papers
13:00 - 14:30 Buffet Lunch

-- POSTER PRESENTATIONS --

ALL POSTERS GUARANTEED EXCELLENT EXPOSURE!

14:30 - 16:00 Lecture - Discussion

"UNRAVELLING PLANT DEVELOPMENT--
WHAT'S INVOLVED?"

Michael Christianson, Zoecon Corporation

16:00 -- Refreshments

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* CALL FOR PAPERS *
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PLEASE SUBMIT TITLES AND ABSTRACTS
OF PLATFORM AND POSTER PAPERS BY

FRIDAY, MARCH 27

(Please let us know how many will be coming from your lab by TUESDAY, MARCH 31)

Mail and further information:

Dick Greyson
Department of Plant Sciences
The University of Western Ontario
London, Ontario N6A 5B7

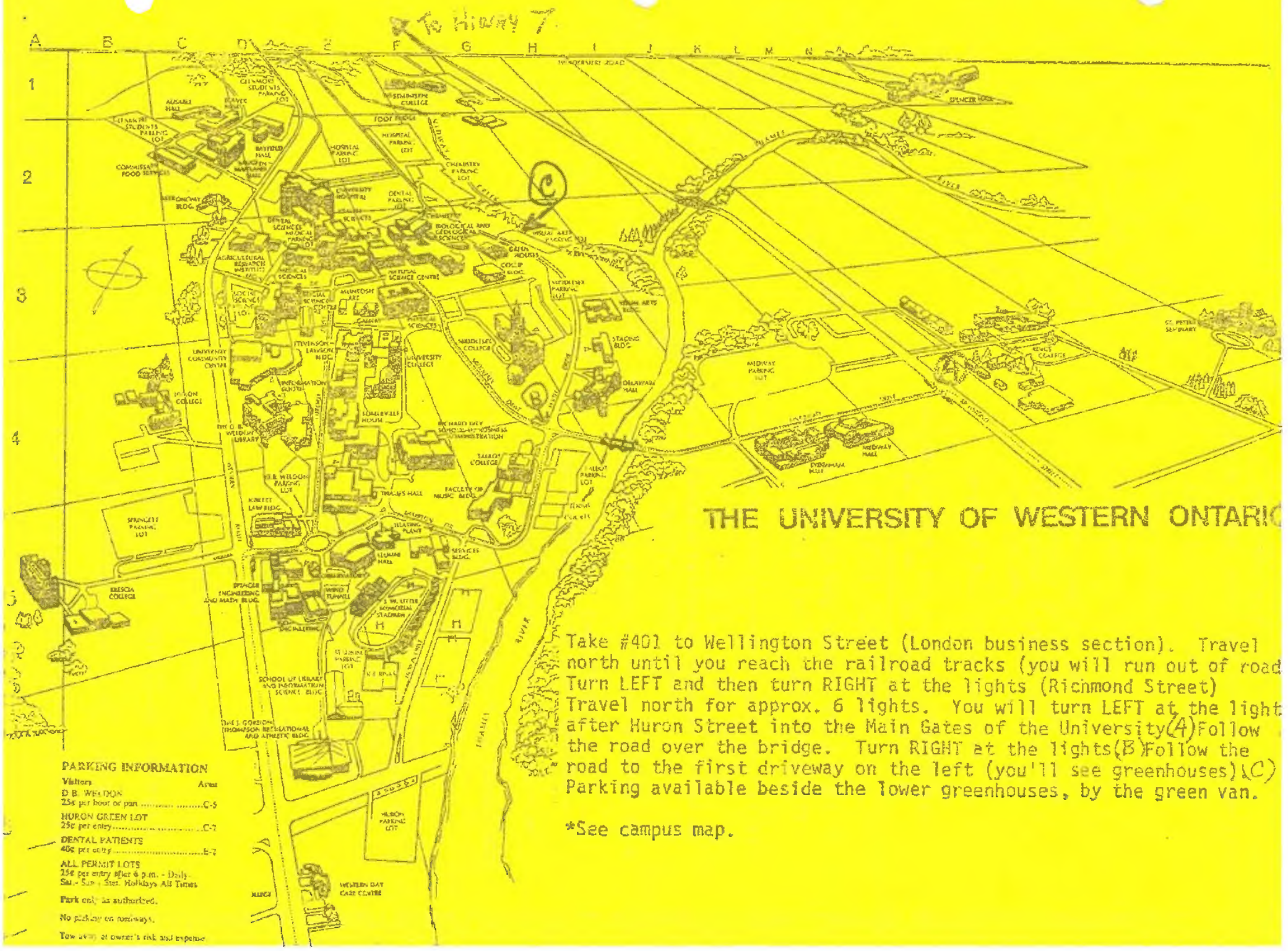
(519) 679-2111, ext. 6491

Leave message at:

(519) 679-2111, ext. 6464

** *Please note map of UWO Campus and parking instructions!!*
(See other side)

NOTE: A REGISTRATION FEE (STUDENTS $4.00; FACULTY $5.00) WILL COVER A BUFFET LUNCH AND INTERMISSION REFRESHMENTS.....



Take #401 to Wellington Street (London business section). Travel north until you reach the railroad tracks (you will run out of road) Turn LEFT and then turn RIGHT at the lights (Richmond Street) Travel north for approx. 6 lights. You will turn LEFT at the light after Huron Street into the Main Gates of the University(4)Follow the road over the bridge. Turn RIGHT at the lights(B)Follow the road to the first driveway on the left (you'll see greenhouses)(C) Parking available beside the lower greenhouses, by the green van.

*See campus map.

19th PLANT DEVELOPMENT WORKSHOP

Saturday, April 4, 1987
University of Western Ontario
London, Ontario

PROGRAM

9:30- 9:50	Rucher, C.J. and K. Zachariah. (Waterloo) The influence of bacteria on Dactyella heterospora
9:50-10:10	Shorthouse, J.D. (Laurentian) Damage and modifications by the beetle Sphenoptera jugosbanica within the roots of diffuse knapweed
10:10-10:30	Kudirka, D. (U.W.O.) The indirect effect of exogenous auxin on initiation of cell divisions in wheat root explants (Triticum aestivum L.) during callus induction
10:30-10:50	Ockenden, I. and J.N.A. Lott (McMaster) Storage of calcium and other minerals in embryos of Cucurbita maxima, C. andreana and their reciprocal hybrids
10:50-11:10	Stewart, A.*, H. Nield and J.N.A. Lott (McMaster and Guelph*) Studies of minerals in barley and seedlings
11:10-11:30	**REFRESHMENTS - Room 217 B&G**
11:30-11:50	Trudel, M-C. and C. Peterson (Waterloo) Development of PHI thickenings in the Cruciferae and Caprifoliaceae
11:50-12:10	Dengler, N. (Toronto) Comparison of shoot vascular organization in isophyllous and anisophyllous species
12:10-12:30	Hodson, M. J. (Glendon College, York) The development of the lemma of the grass Phalaris canariensis L. with particular reference to its silicified macro hairs
12:30-12:50	Walden, D. (U.W.O.) "Biological Filler"
13:30-14:30	**BUFFET LUNCH - SOGS Lounge, Middlesex College**
14:30-18:00	Lecture - Discussion MICHAEL CHRISTIANSON, Zoecon Corp., Palo Alto, Calif. "Unravelling Plant Development --- What's Involved"

PLATFORM PAPERS

C.J. RUCHER and K. TRACHUK, Dept of BIOLOGY, WATERLOO UNIVERSITY.

THE INFLUENCE OF BACTERIA ON Dactylella heterospora

The nematode-trapping fungi are a puzzling group of hyphomycetes which subsist in the soil by predating on nematodes and by decomposing dead organic matter. Their apparent nutritional flexibility and their ubiquity in most soils should make them ideal bio-control agents of plant-parasitic nematodes. However, initial field trials have not shown any effective control of populations of nematodes. It is unclear to what extent facultative predaciousness or poor competative ability were responsible for past failures. For future field trials to meet success, more knowledge of the biology of this diverse group of fungi needs to be accumulated. In our work on the influence of bacteria on the constricting-ring trapper Dactylella heterospora, we found that different strains of bacteria caused great variations in the germination of conidia, mycelial growth and the morphogenesis of trapping organs. In addition, Serratia marcescens was shown to induce the formation of chlamydospores in Dactylella heterospora.

Damage and Modifications Inflicted by the Beetle Sphenoptera jugoslavica Within the Roots of Diffuse Knapweed.

J.D. Shorthouse
Department of Biology
Laurentian University
Sudbury Ontario

Sphenoptera jugoslavica is a gall-inducing buprestid beetle introduced into British Columbia from Europe as part of an attempt to biologically control diffuse knapweed, a noxious weed covering about 50,000 ha. of prime rangeland. Results presented are part of a study to evaluate several gall-inducers introduced to structurally and physiologically damage their hosts.

Eggs are laid early in August on leaves of rosettes. Freshly hatched larvae bore into the roots where they remain until the following spring consuming pith and secondary xylem. Larval feeding also induces proliferation of callus and the formation of a gall. Some larvae feed in the root-stem transition where they induce atypical development of vascular bundles.

STUDIES OF MINERALS IN BARLEY GRAINS AND SEEDLINGS WITH EMPHASIS UPON THE AVAILABILITY OF CALCIUM TO THE ALEURONE LAYER

Ann Stewart a*, Hilary Nield and John N.A. Lott
Department of Biology, McMaster University
a Department of Botany, University of Guelph

Abstract

The Ca, Mg, P and K content of dry barley (Hordeum vulgare) grains and seedlings was investigated to determine if the 10-20 mM Ca^{2+} that experimenters routinely add to isolated aleurone layers could approximate the conditions inside an intact grain. Energy dispersive x-ray analysis of protein bodies in aleurone cells showed that there was very little Ca in relation to P, Mg and K. Neutron activation analysis also showed that the endosperm contained very little Ca in relation to the other three elements. Surface sterilization and soaking treatments brought about slight loss of Ca and more loss of K from embryos. Over 6 days of growth the seedling plant gained minerals from the endosperm. While there is a large degree of correlation as to the volume of the free space in an endosperm and the extent to which Ca is bound, our estimates suggest that 10-20 mM Ca^{2+} is unlikely to occur in the endosperm of an intact grain.

STORAGE OF CALCIUM AND OTHER MINERALS IN EMBRYOS OF CUCURBITA MAXIMA, CUCURBITA ANDREANA AND THEIR RECIPROCAL HYBRIDS. I. Ockenden and J.N.A. Lott, McMaster University, Hamilton, Ontario L8S 4K1.

Mineral reserves of embryos of Cucurbita maxima, C. andreana, C. maxima x C. andreana and C. andreana x C. maxima consist mainly of Mg, K, Ca and P. The embryos contain much less Ca than Mg, K and P. Calcium levels also show a higher degree of variability than do the levels of Mg, K and P. The embryos from the small-sized seeds of C. andreana contain about three times more Ca per gram embryo tissue than the embryos from the large-sized seeds of C. maxima. The hybrid embryos differ in Ca levels from both their parents and from each other. The two parent species also differed in their relative proportions of Mg and K. C. andreana embryos had a lower percent of Mg than K while C. maxima embryos and both types of hybrid embryos had more K than Mg. Mineral concentrations in both inner and outer seed coats differed from the concentrations of minerals in the embryos. Embryos contained higher amounts of Mg and P than either of the two seed coats. Potassium predominated in the outer seed coat. The highest Ca concentration was present in the inner seed coat.

DEVELOPMENT OF PHI THICKENINGS IN THE CRUCIFERAE AND CAPRIFOLIACEAE 7

DEPT. of BIOLOGY, WATERLOO UNIVERSITY, WATERLOO
Marie-Claude Trudel

Phi thickenings are lignified, cellulosic deposits found in the radial and tangential walls of cortical cells in the roots of some species. There are three different types of phi thickening: phi (Rosaceae), lattice (Cruciferae) and ladder (reported in the Caprifoliaceae). However, I have not observed the latter type in several species in the Caprifoliaceae. Presently, these thickenings are thought to act as support structures for large cortical cells. Structural changes in phi thickenings during primary and secondary growth of roots have been studied by means of clearing, as well as freehand and ultramicrotome sectioning. The thickenings develop along with xylem vessels near the root tip. At the lateral root junctions, the thickenings are removed, forming an opening through which the lateral roots emerge. During secondary growth (thickening) of the root, the regular tabular shape of the thickenings changes to oblanceolate; the middle lamella pulls apart, giving a disorganized pattern to the layer. An extract from Chelidonium majus roots has been used to visualize the phi thickenings. The alkaloid components of the extract have been identified and quantified. Lignified structures treated with Berberine fluoresce golden yellow under violet light. The dye-substrate binding mechanism is being investigated. It has been suggested that a face to face hydrophobic interaction exists between the aromatic benzene rings in the lignin network and the pentacyclic dye chromophore.

The development of the lemma of the grass Phalaris canariensis L., with particular reference to its silicified macrohairs.

M.J. HODSON
Division of Natural Sciences, Glendon College, York University, Toronto, M4N 3M6.

The lemma of P. canariensis has been investigated at several harvests, before and after inflorescence emergence. Silica deposition takes place after emergence in both the outer epidermal long cells and the macrohairs covering the outer epidermis. Transmission electron microscopy indicated that in the macrohairs silica deposition was confined to the cell walls. Concentration of K, Ca, Mg and Cl in the whole lemma declined following panicle emergence as did tissue water content. Using freeze substitution, transmission electron microscopy and x-ray microanalysis Si, K, Cl and P were located in the macrohairs at the subcellular level.

POSTERS

ONCOGENE RELATED SEQUENCES IN MAIZE

R.B. Zabultonis, J.D. Procunier, and D.B. Walden.
Dept. of Plant Sciences, U.W.O., London, Ont.

Oncogene related sequences found in eukaryotes have been shown to be intimately involved in cell growth (Pardee et al, 1985, Mediators in Cell Growth and Differentiation). The addition of growth factors to quiescent cells in culture (eg. NIH 3T3 cells) has been demonstrated to rapidly induce the transcription of several such genes, eg. c-fos, c-myc, and c-Ki-ras (Campisi et al, 1984, Cell 36:241; Greenberg and Ziff, 1984, Nature 311:433). Antibodies against c-Ha-ras protein, when microinjected into dividing cells cause them to become arrested just prior to S-phase, showing that the c-Ha-ras protein is necessary for the initiation of S-phase (Mulcahy et al, 1985, Nature 313:241).

These oncogene related sequences in eukaryotes were first discovered in the late 1970's through the use of their retroviral homologues. By using these viral oncogenes as probes, homologous sequences have been found in three of the four eukaryote kingdoms. Only the plant kingdom has no reports of being surveyed for such sequences.

The biochemical properties of the proteins coded for by the oncogene related sequences have been determined in a few cases and also show remarkable evolutionary conservation. For example, in yeast, the protein from the ras gene investigated has been shown to have GTP binding capability and GTP hydrolytic activity as do all mammalian ras gene products (Temeles et al. 1985, Nature 313:700). However, not one of the approximately forty oncogene related sequences discovered so far has a cellular function assigned to the protein it codes for.

The availability of probes for oncogene related sequences, the paucity of higher plants screened for such sequences, and the importance of these genes in other eukaryotic species were considerations in screening the maize genome. A discovery that such sequences are present in maize, and are transcribed and translated would solidify the argument that due to their ubiquity and evolutionary conservation, these genes are important to cell function. Further, the physiological, biochemical and genetic information known about maize and the experimental techniques that can be employed on maize may provide the necessary foundations and tools to determine the cellular function of these oncogene related sequences.

MAIZE EAR INFLORESCENCE CULTURE: I. Maturity of anthers and pollen production; II. Ovary and embryo sac development.

Bommineni V. R., and R. I. Greyson. Department of Plant Sciences University of Western Ontario, London, Ontario N6A 5B7.

Maize (Zea mays L.) ear inflorescences (cv. Seneca-60, Oh43, anl/anl) were cultured in M & S medium with optimum levels of different PGRs. Male spikelets developed in the presence of KN and female spikelets developed in GA3 medium. IAA in the medium exhibited the intermediary effects. Observations were made on the maturation of pollen, development of ovary and silks. Further experiments also carried out to test the viability of differentiated pollen, ovary, and silks.

POLYPEPTIDE DIFFERENTIATION WITH MATURATION OF MAIZE FLOWER ORGANS.

Bommineni V. R., Greyson R. I., Walden D. B., and B. G. Atkinson. Dept. of Plant Sciences and Dept. of Zoology. Univ. of Western Ontario, London, Ontario N6A 5B7.

Maize inflorescences mature to unisexual flowers from bisexual spikelet primordia. Synthesized polypeptides were extracted from different steges of tassel and ear inflorescences and resolved on two dimensional polyacrylamide gel electrophoresis (2D-PAGE). Fluorograms of 2D-PAGE exhibited the association of polypeptides with mature organs. Some polypeptides may appear or disappear during the development and many others are common to both inflorescences also noticed on 2D-PAGE patterns.

Competence → Determination → How = devel, mRNA (b.t.f. movement

EFFECT OF TUNICAMYCIN AND MONENSIN ON PEANUT EXTRACELLULAR PROTEINS IN SUSPENSION CELL CULTURE.

A.S.K., Tam and R.O., van Huystee (1987) University of Western Ontario, London, Ontario, CANADA N6A 5B7

Extracellular proteins had been extracted sequentially by acetone and ammonium sulfate from 14 days old peanut (Arachis hypogaea L.) suspension cell cultured medium. About 23 polypeptide bands were observed by separating the extracellular protein extract with one-dimensional SDS-PAGE under non-reduced condition. Most of the polypeptides (about 70%) were cationic in nature. According to PAS glycoprotein staining profile, 40% of the cationic extracellular polypeptides were glycosylated whereas 70% of the anionic polypeptides were glycosylated. In addition, cationic glycopolypeptides seemed to contain higher carbohydrate content than the anionic.

In order to reveal the presence of N-linked glycosylation and grossly study the protein transport mechanism, tunicamycin and monensin were used respectively. In tunicamycin study, secretion of peroxidase plus other cationic glycopolypeptides was inhibited in a dose-independent fashion; whereas 3 out of 5 anionic glycopolypeptides were not affected by the treatment. This result indicates that the unaffected polypeptides may posses O-linked glycosidic side chain. In monensin study, secretion of peroxidase plus majority of other extracellular polypeptides was inhibited in a dose-dependent fashion. Nevertheless, approximately 6 of the extracellular polypeptides were not affected by the treatment which in turn suggesting that some of those unaffected polypeptides may by-pass the Golgi apparatus and still be released. It should be noted that, in both studies, additional polypeptides which may identify as stress proteins were observed in the treatments.

By analyzing the experimental significences between peanut peroxidase and the other extracellular proteins. The reasons why cationic isozyme is the major extracellular peroxidase will be discussed and postulated.

Ron Denglar
U. of T.